

Claims

1. A method for the continuous real time tracking of the position of at least one mobile object in a defined multidimensional space, comprising at least one mobile transmitter module which is attached to at least one mobile object of the system that is to be analyzed and whose signals are received by a stationary receiving and signal processing network and are processed centrally, wherein the signals emitted by the at least one transmitter module are electromagnetic waves which are transmitted within a frequency band range utilizing a time division multiplex technique, **characterized in that** the available frequency band is used as a single channel for the purposes of maximizing the accuracy of the position detecting process, and in that the communication process between the transmitters (S, Sp, Sb) and the receivers (E₁,..., E_n) is based on the principle of pseudo-random time division multiplex using non synchronized pseudo-random patterns, and in that the transmission signals in the different burst transmissions (B) are characterized by a low cross correlation.
2. A method in accordance with Claim 1, characterized in that the principle of pseudo-random time division multiplex comprises the processes of transmitting (S, Sp, Sb) at isolated, irregular time points, whereby each transmitter (S, Sp, Sb) uses a different pseudo-random sequence for the transmitting time point.
3. A method in accordance with Claim 1, characterized in that the receivers (E₁,..., E_n) estimate the time point of the next burst transmission (B) from a certain transmitter (S, Sp, Sb) in the knowledge of the pseudo-random time division multiplex and the known pseudo-random pattern.
4. A method in accordance with Claim 3, characterized in that only those signals are evaluated which arise at the predetermined time point of the next burst transmission (B).
5. A method in accordance with Claim 3, characterized in that the process of predetermining the next burst transmission from a certain transmitter (S, Sp, Sb) is effected continuously.
6. A method in accordance with Claim 1, characterized in that the transmitter modules are miniaturized in such a manner that they are adapted to be inserted even into a ball.

7. A method in accordance with Claim 1, characterized in that the frequency band lies at approximately 2.4 GHz.
8. A method in accordance with Claim 1, characterized in that the frequency band has a bandwidth of 80 MHz.
9. A method in accordance with Claim 1, characterized in that stationary reference transmitters (R_1, \dots, R_n) are used as position references for the purposes of minimizing errors and for the calibration of the system, said reference transmitters transmitting an identification code in a sequence in like manner to the at least one mobile transmitter (S, Sp, Sb) for the at least one moving object that is to be analyzed, and the signals from said reference transmitters being detected by the receivers (R_1, \dots, R_n) for the purposes of determining their time of arrival at the respective receivers.
10. A method in accordance with Claim 9, characterized in that the reference transmitters are synchronized over cables, preferably, glass fiber cables.
11. A method in accordance with Claim 1, characterized in that the burst transmissions (B) are sent utilizing non synchronized pseudo-random patterns which are a combination of the access mechanisms, time division multiplex and code division multiplex.
12. A method in accordance with Claim 1, characterized in that the pseudo-random patterns are prime number sequences.
13. A method in accordance with Claim 1, characterized in that, in the case of the burst transmissions (B), the separation of at least two signals of different origin arriving randomly at the same time is effected by the receiver.
14. A method in accordance with Claim 1, characterized in that the burst transmissions (B) are transmitted at a pulse rate which is so high that undetected individual values are tolerated.
15. A method in accordance with Claim 1, characterized in that the non synchronized burst transmissions (B) from the at least one mobile transmitter module of the transmitters (S, Sp, Sb) are adapted to be synchronized by a receiver module in the transmitter (S, Sp, Sb) in order to reduce the probability of overlaps when there are many transmitters.

16. A method in accordance with Claim 1, characterized in that the analogue reception signals received at the HF front-end are digitized in an evaluating unit, and the time points, at which the signals from the respective transmitters (S, Sp, Sb) are received, are determined and stored.
17. A method in accordance with Claim 1, characterized in that different algorithms can be used for the processing of the received and stored signals in dependence on the situation.
18. A method in accordance with Claim 17, characterized in that the signal is divided into, possibly overlapping, sections for the processing of the received signals, and the best respective algorithm or a plurality of algorithms are used simultaneously for the individual sections.
19. A method in accordance with Claim 17, characterized in that the signal is divided into, possibly overlapping, sections for the processing of the received signals, and a rotated time axis is also used for individual sections so that e.g. discontinuities in highly dynamic processes are approached from two sides.
20. A device for transmitting electromagnetic waves for use in a method for the continuous real time tracking of the position of at least one mobile object in a defined multidimensional space comprising
 - at least one mobile transmitter module which is attached to at least one mobile object in the system that is to be analyzed,
 - including a stationary receiving and signal processing network for receiving and processing the signals which are transmitted by the transmitter module, said signals being waves which are transmitted in a frequency band range using a time division multiplex technique, characterized in that there are provided communication means which carry out a transmission process between the transmitters and the receivers in the available frequency band serving as a single channel using the principle of pseudo-random time division multiplex with non synchronized pseudo-random patterns, and in that there are provided transmitter means which transmit the transmission signals in the form of different burst transmissions (B) having a low cross correlation.

21. A device in accordance with Claim 20, characterized in that reference transmitters (R_1, \dots, R_n) are provided with trigger and clock pulse signals which are fed in from the signal network.